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Review

Risk factors for conversion of laparoscopic cholecystectomy to open surgery – A systematic literature review of 30 studies

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ABSTRACT

Background: The study aims to evaluate the methodological quality of publications relating to predicting the need of conversion from laparoscopic to open cholecystectomy and to describe identified prognostic factors.
Method: Only English full-text articles with their own unique observations from more than 300 patients were included. Only data using multivariate analysis of risk factors were selected. Quality assessment criteria stratifying the risk of bias were constructed and applied.
Results: The methodological quality of the studies were mostly heterogeneous. Most studies performed well in half of the quality criteria and considered similar risk factors, such as male gender and old age, as significant. Several studies developed prediction models for risk of conversion. Independent risk factors appeared to have additive effects.
Conclusion: A detailed critical review of studies of prediction models and risk stratification for conversion from laparoscopic to open cholecystectomy is presented. One study is identified of high quality with a potential to be used in clinical practice, and external validation of this model is recommended.

Contents

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1. Introduction

One of the most common causes of abdominal pain is the presence of gallstones.[1] Cholecystectomy is the only effective management of symptomatic gallstones, with 93% of gallbladder disease problems referred to surgeons.[2] Open cholecystectomy (OC) has been widely replaced by laparoscopic cholecystectomy (LC).[3] However, current literature suggests that the rate of intraoperative conversion from LC to OC is 1%–15%,[4–6] and that conversion is known to increase perioperative time, complication rates, perioperative costs, the length of hospital stay, and hospital charges.[7,8] Conversion is also associated with complications including death, bile duct injury, bile leak, or bleeding, requiring reoperation or transfusion.[9] It is, therefore, essential to identify risk factors for conversion to allow for safer procedures and better surgical planning. A systematic assessment of these factors preoperatively allows determination of whether OC surgery should be performed initially, avoiding the potential complications brought through an intraoperative conversion from LC to OC. Further, effective conversion prediction models allow patients the

Table 1
Search strategy for PubMed.

((((“epidemiology”[MeSH Terms] OR “models, statistical”[MeSH Terms] OR “nomogram”[MeSH Terms] OR “risk factor”[MeSH Terms] OR risk* OR “risk assessment”[MeSH Terms])))) AND ((((“Cholecystectomy”[MeSH Terms]) OR “Biliary Tract Surgical Procedures”[MeSH Terms]) OR “Cholecystectomy, Laparoscopic”[MeSH Terms])) AND (conversion to open surgery[MeSH Terms] OR “conversion to open surgery” OR open surgery[MeSH Terms] OR conver*))

Table 2
Search strategy for Scopus.

(INDEXTERMS(“epidemiology”) OR INDEXTERMS(“models, statistical”) OR INDEXTERMS(“nomogram”) OR INDEXTERMS(“risk factor”) OR risk* OR INDEXTERMS(“risk assessment”)) AND (INDEXTERMS(“Cholecystectomy”) OR INDEXTERMS(“Biliary Tract Surgical Procedures”) OR INDEXTERMS(“Cholecystectomy, Laparoscopic”)) AND (INDEXTERMS(“conversion to open surgery”) OR “conversion to open surgery” OR INDEXTERMS(“open surgery”) OR conver*)

Table 3
Criteria for estimating risk for bias.

	Low risk	Intermediate risk	High risk
All analysed independent variables are defined	All independent variables analysed are described/defined	At least 70% of all independent variables are described/defined AND the number of non-described variables are stated (Hence you know the total number of independent variables analysed)	The number of independent variables remains unclear OR less than 70% of all independent variables are clearly described/defined.
Sample size calculation	Sample size calculation done AND it is described how it was done AND The estimated sample size (or more) was recruited.	Sample size calculation done AND it is described how it was done AND not able to recruit estimated sample size	No sample size calculation OR no description of how it was done
Data extraction procedure described	Medical chart or reliable database; manually read charts or that they had some mechanism to ensure the quality of their database	Data extracted from a database and no mentioning of a mechanism to ensure quality in that database	No mentioning of how data is extracted
Statistical analysis described	Clearly described what is being used to analysed data	Analysis described but not in detail	Analysis not discussed
Multivariate analysis	(Multivariate stepwise regression + entry & removal) OR (Multivariate non-stepwise stating which variables were entered or if all variables entered)	Stating multivariate regression and stating if it was logistic or Cox but no more details	Multivariate analysis not mentioned or not using multivariate regression
Missing data presented	Give exact numbers of missing data + explain why there are more missing data for some variables	Give exact numbers of missing data but no explanation for why some variables have more missing data	Number of missing data for each variable not provided
Missing data discussed	Missing data discussed on how they should be managed in statistical analysis and final interpretation.	Mentions missing data in discussion but unclear how they managed this	No discussion about how they managed missing data
Validation of model (internal or external) presented	External validation of model presented either as sensitivity and specificity OR Area under curve (AUC).	Internal validation of model presented either as (Cox&Snell R Square OR Naegelkirke R-square) OR Area under curve (AUC).	Outcome of internal or external validation of their final model is not described

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